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THE GENESIS OF THE MAYA ARCH

BY EDWARD H. THOMPSON

UNTIL now, it has been the generally accepted belief among archeologists that the entire plan of the ancient stone structures of Yucatan was developed elsewhere, that in some unknown region the evolution of this structural type had been carried out until perfected, crystallized as it were, before the first stone structure was built on the peninsula of Yucatan. I find no evidence to maintain this belief, while I do find much, and, to me, conclusive evidence of a very typical process of development from the *ná* or the native palm-thatched hut of Yucatan, to the magnificent structures of stone and lime that crowned the terraced levels in these ancient centers of population on the peninsula. I regard, not the stone structures, but the little known and still less studied ná as the primitive, the unchanged and unchanging type structure. As it is today so it was in all essentials before the stones were quarried, the lime burned, or the flints chipped, that helped to make the first stone structure on the peninsula of Yucatan. I claim that the ná is the germ unit of the edifice chambers, and the edifice simply a collection of nás expressed in stone and mortar. While my examples are specific, the claim covers and the facts hold good generally all over the Maya area. Wherever this race of ancient builders, now called the Mayas, held sway, there the ná with its environmental changes became the type unit. I shall seek to prove these basic facts with few words but many examples.

Commencing, as we logically must, at the very foundations, I will say that the seemingly general impression that all the stone structures in Yucatan are built on pyramids is as wrong as is, to me, the belief in the necessarily exotic origin of these ancient centers. Only the religious structures, temples, shrines, or altars, were so placed. The public buildings, palaces, and other structures of the kind were usually built upon terraces, higher or lower probably, according to the power and desires of their builders. Any person living today in Yucatan, who is building a home, will, if common sense governs and his means permit, place his edifice upon what is practically a terraced foundation, as did those ancient builders. The difference that even a few feet of elevation makes in this land of general level, is but little short of marvellous. It makes all the difference between constant smarting in a candent heat and a cool fresh atmosphere conducive to comfort and calm repose.

Slave owners can command and unpaid labor can be made to produce conditions looking to the superlative in comfort and luxury. Hence these high-terraced structural levels. There is no hidden mystery and no exotic origin, but a successful effort of a slave-holding people to be as comfortable as they could be regardless of cost, life or labor cost. This is but common sense applied on a slave-owning basis.

That the temples *are* built on high pyramids does not affect this question; all religions seek to give that which is best to their deities. If mortal man can secure reposeful comfort by the elevation of a few feet above the general level of the earth around him, then the mansions of the Deity must be placed as far above those of mortal man as He Himself is above mere manhood. That is the applied theo-logic of all times. It was applied in the shape of high truncated pyramidal sub-structures on the peninsula of Yucatan. To this may be coupled the ever pervading idea that God is to be worshiped on high places. There is no deep mystery and necessarily exotic origin in these ideas either, for they are world wide, soul deep, and all time long in human kind.

The base, the sub-structure, as a part of the entire plan, being now removed as a factor of the problem, I will seek to prove my assertion that the stone edifice is but the development of the palm-thatched ná.

My investigations have filled me with a respectful admiration of the ná as a habitation. The typical palm-thatched ná is as near the perfected structure of its class as a structural formation can be, it is like a natural growth, a thing built of the elementary particles of the region, and is itself a part of the environment, like the knots of the tree, the nest of the squirrel, or that of the humming bird. One may pass close by it in the forest, and yet it will still be hidden, merged in the surroundings. On the edge of the grassy savannah it is confounded with the thorny foliage caps and the low tree tops. It is perfectly ventilated, the vitiated air escaping and the fresh air entering by percolation and not by draughts. It is cool in the hot weather and warm in the cool season; no rains, however prolonged or heavy, can enter the roof of a well made ná, while the smoke of the *koben* or three-stoned fireplace, rising up to, and percolating through the thatch, keeps out the noxious insects and other vermin.

Like many other apparently elemental creations, the ná is really complex, being itself the slow and gradual development of unnumbered centuries; in fact the development of the perfected ná from the mere leaf shelter through its various stages is a fascinating study in structural evolution, which I shall undertake later, but it is not germane to the present article, which must commence with the perfected ná and end with the perfected edifice of stone.

Although the perfect ná is really the product of long-continued development, I think that in my researches in the Labná group of ruins I have proved conclusively that the palm-thatched huts, the nás of then and now, have undergone no change in type form. We will therefore describe the building and give the measurements of the type ná. We will then take these type forms of thatched ná and stone edifice and compare them, first in detail, the thatched ná with the single chamber of the edifice, and then the edifice as a collection of units, chambers or nás as they may be.

The village of Pisté is the native pueblo nearest to the ruined group of Chichen Itzá. I selected a ná in Pisté, built by pure-blooded natives, who, having never journeyed far from the pueblo, could not have had their building ideas changed from the general usages of the region and their people. All of the data, measurements, and so forth concerning these primitive ná types will be understood as having been taken from the Pisté structure, unless otherwise stated.

In the famous ruined group of Chichen Itzá, by far the most important and typical of all the ancient groups of the peninsula, there is an edifice called by the natives *Ah-kat-tzib*, "the house of the writing in the dark,"—*ak-kab* writing, *tzib* darkness (pl. xxx)—so called from the fact that in the darkness of an inner chamber is a stone lintel, on the under side of which are lines of inscriptions and a seated figure seemingly in the act of offering burnt sacrifices. This edifice, though large, has no special points of interest, other than those of the above mentioned lintel. It is merely a very average example of these ancient structures, and as such I chose it. It has neither the high-ceiled chambers of the "House of the Governor" at Uxmal nor, on the other hand, the tiny ones of the "El Meco" type. All of the chambers are average in dimensions as in other particulars. Of these I selected the southwest corner chamber, as in several ways a typical one and so best suited to my purpose. All my figures and facts concerning the chambers of a stone edifice are taken from this one chamber, unless otherwise specified.

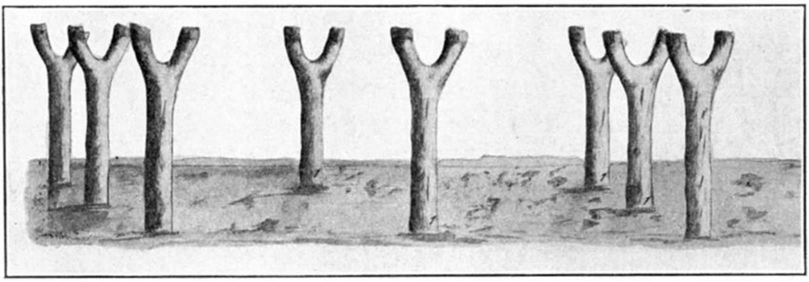
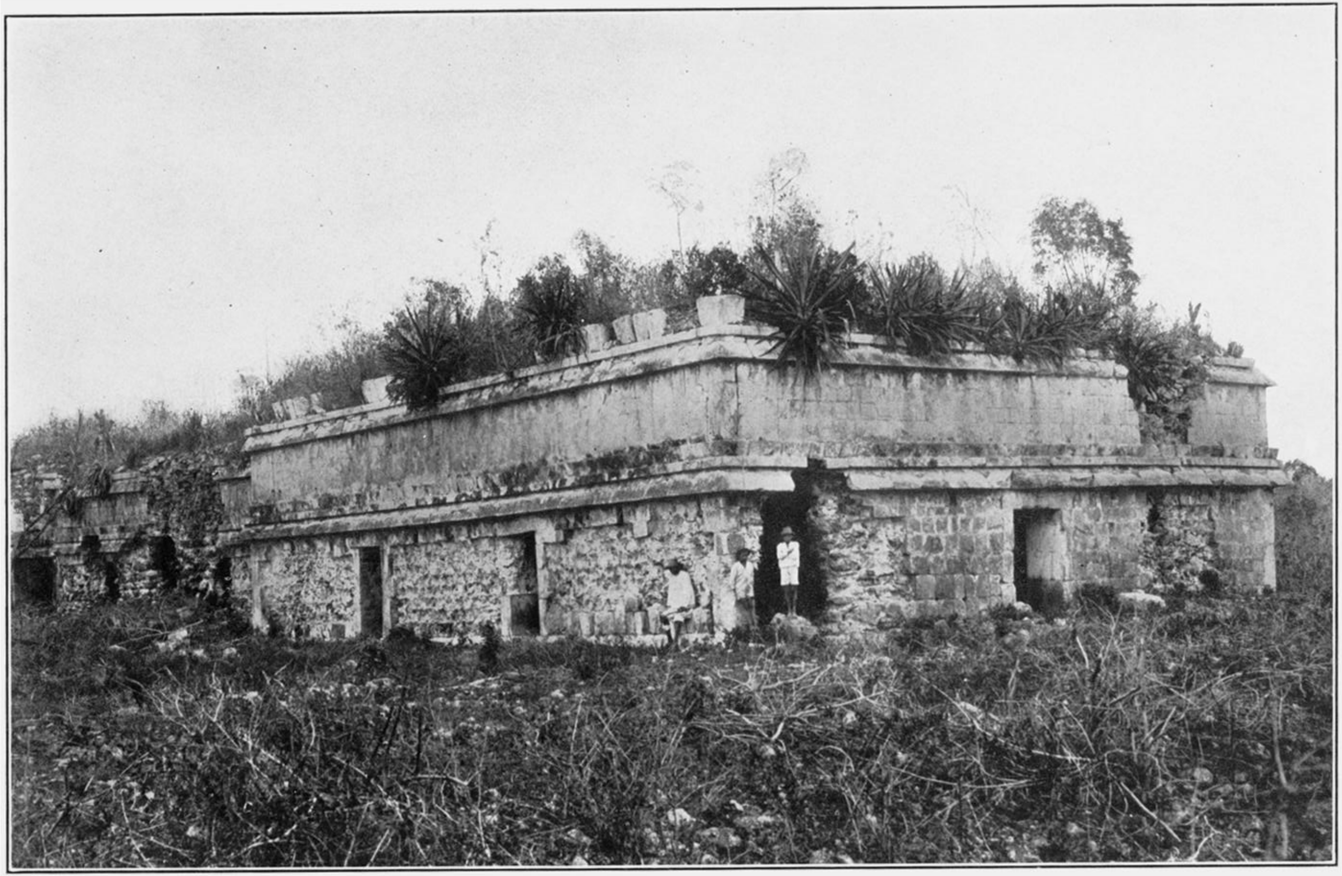


FIG. 61.—The Maya ná : The ocomes or forked posts.

In the building of the ná the size is first to be determined, and this is fixed, not by the ground plan, but by the length of the *hol-ná* or ridge-pole (*hol* head and *ná* house, that is house-head). This determined and the site selected, all else falls into the grooves worn smooth for them by the attrition of ages.

Six or eight large *ocomes* or forked posts are firmly fixed in the



AH-KAT-TZIB, THE HOUSE OF THE DARK WRITINGS

The chamber where the natives are standing is the one mentioned in the accompanying paper ground in their proper places (fig. 61). This is a work of much importance, for upon these ocomes rest the well-being of the structure, literally as well as figuratively. These must be perfectly aligned, adjusted to each other, and above all firm, if the ná itself is to be sound and true. The wall structure is after all a mere screen, a light filter or wind break, necessary in a way but not all important; so reasons the ná builder, and he acts accordingly.

With the ocomes rightly in place and firmly fixed, then come the *balós*, the first and the thickest of the important cross-pieces, the *pach-ná* house-back (from *pach* the back of, and *ná* the house), so called from the fact that it supports practically all of the thatched roof, and it will be remembered that the roof *is* the ná. The pach-ná must be long and straight to fit snugly, and be bound tightly to both balós and ocomes by the rattan-like vines of the *anicarp* or *bejuco* (fig. 62). After the pach-ná come the *tijeras* and the *hol-ná* or house-head (*hol* head, and *ná* house), in other words the ridge-pole; these two, the tijeras and the hol-ná, together define the form of the roof. Note this fact for later it becomes of importance (fig. 63).

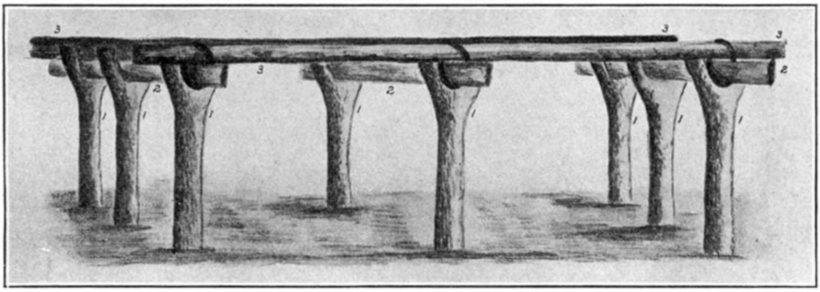


FIG. 62.—The Maya ná : 1, the ocomes or forked uprights ; 2, the balós or first cross-pieces ; 3, the pach-ná or first stringers.

Before the tijeras can bear the weight of the hol-ná, the ridge-pole, or even prudently be allowed to sustain themselves, they must be braced and strengthened by the important second cross-piece, the *cap-aac* or turtle's arm (*cap* arm and *aac* turtle). Without this cross-piece and the thick first cross-piece, the baló, the entire roof structure would be liable to collapse, as a house of cards. Make special note of this fact, because of its latent importance.

After the cap-aac comes the *bel-chó* or way of the rats (*bel* way and *chó* rats), and well named it is, although we would know it better as the second roof-stringer.

The *xol-much* the toad's crutch (*xol* crutch and *much* toad), the diagonal roof braces that serve to stiffen the structure lengthwise, are firmly bound in place, and then come the *uinkin-chés* or man-poles. These are long, semi-flexible poles channelled at the extremities and bound, both to the hol-ná or ridge-pole, and to the bel-chó, and the pach-ná or stringer. They thus form the foundation upon which the palm-thatch rests, and for this they are called the *uinkin-chés*, the euphonic transposition of the word *uinic* man and the word *ché* pole, man-pole.

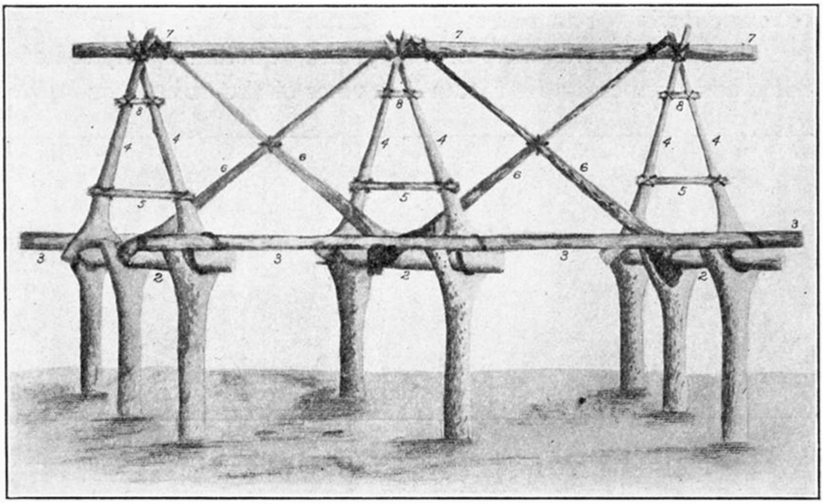


FIG. 63.—The Maya ná : The eight upright supporting posts are the ocomes ; 2, the baľós ; 3, the pach-ná ; 4, the tijeras ; 5, the cap-aac; 6, the xol-much; 7, the hol-ná ; 8, the chan-cap-aac.

Upon the man-poles, at right angles to them, are laid long, slender saplings, separated by a space of about a foot. These rods, or *jiles* (pronounced *heeles*) (fig. 64), must also be bound tightly and with special care, for if they become loose the thatch will be liable to leak, and ruin comes quickly upon a leaky thatch. The thongs that bind the jiles to the uinkin-chés are not the bejucos or vines of the *anikab* but the fire-seared leaves of the *chelem* and the *cahum*, wild agaves. These leaves, seared and divided into long stringy green thongs, are as supple as wet cow-hide, and as strong as so many hide lacings. Anything bound by them, and these natives know well how to bind, become, when these thongs dry, about as firmly bound as anything can be, without solder or welding. In fact the finished frame of a well built ná is so taut and firm that it almost hums like a drum when struck with the open palm of the hand.

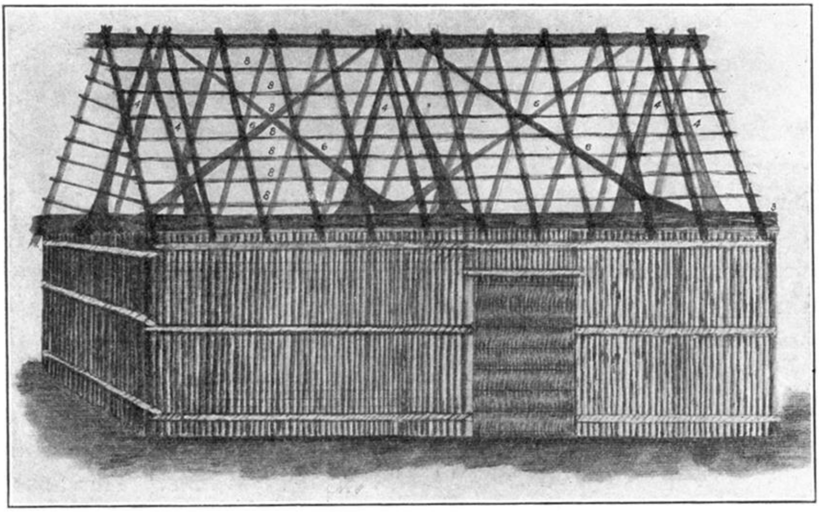


FIG. 64.—The Maya ná; 3, the pach-ná, stringers; 4, the tijeras; 6, the xol-much or diagonal braces; 8, the jiles.

The leaves for thatching the house before it can be called a finished ná have been cut from the tree some time before and have been dried in the sun until the chlorophyll-green of the mature leaf has changed to the light straw-color of the perfectly dried one. These leaves are the large palmates of the *Sabal Mexicana*, called by the natives *xan* (pronounced *shan*). When dried they are bound in bundles and stowed away in dry places, until used. The leaf in the bundle is left as it comes from the tree, cut from its long stem with only about six inches of it left as a kind of handle (fig. 65). When made ready for the thatch, the leaf is so trimmed that only the portion remains represented in figure 66 by the full lines, the dotted portion representing the parts removed. The palm-leaf or *huano*, as it is called, is then divided into three parts by twisting the two outer portions until they take the form shown in figure 67. These parted leaves are placed on the jiles as there shown and as in figure 68. They are firmly held in place by the pressure of the one against the other, each being "skewered" upon the jile. The huanos upon one jile well overlap those directly below, like the shingles upon a roof, and they all together form the water-proof thatch of the ná.

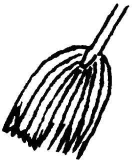


Fig. 65.

There still remains one very important portion of the thatching of the ná, and that is the placing of the *pac-hol-ná* (the cap of the house-head). This is the palm-leaf covering over the hol-ná bound down by the *kat-ché* and *hol-ché*, pole binders. The kat-ché are the two short binders and the hol-ché, or head-poles, are the long ones. In figure 69 is shown the cap-like covering of palm-thatch, the pac-hol-ná, held in place by the kat-ché and the hol-ché.

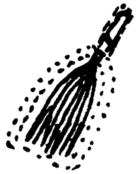


Fig. 66.

The floor of the type ná is raised about a foot above the general outside level, and is upheld by the *pak* or rim composed of *kan-kab*, mud and stone puddling, faced with mortar of white earth, *sahcab*, and lime. This floor, I am sorry to have to say, was of red earth only, stamped hard, but in many other nás that I have known the floor has been made of a mixture of three parts finely sifted white earth to one part of lime, and both well mixed with water, in which strips of *chucum* bark have been soaked. This chucum bark is very rich in tannin and the mixture, spread in layers on the floor surface, well pounded down, and burnished with smooth stones, *kas*, by strong and practised arms, gives a cream-colored floor-surface with a slight pinkish tint, as hard and as serviceable as can be desired.

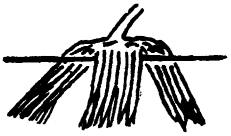


Fig. 67.

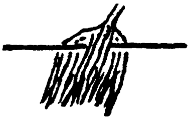


Fig. 68.

The ná has neither doors nor windows as we understand them.

A screen of vines interlaced around, and stiffened by, a woof of slender poles, and held in place by loops of the same kind of vine passing through the edge of the screen and interstices in the entrance posts, serves all their needs, and admirably so. During all of my long experience among these people, I can not recall a single instance where these primitive door-screens have been wilfully, or rather criminally, violated.

The outer wall-spaces between the front and the rear entrances are filled up with small, straight poles, placed upright close together, and firmly bound with stout, thick bands of twisted and interlacing vines. These bands are three in number always, and divide the wall-space into two zones. Sometimes the wall surface thus made is left so, at other times it is covered with a mortar made of red earth, *kankab*, chopped grass, *chac-suc*, and *ha*, water, well kneaded together into a tenacious, plastic mass, that, when worked by practised hands into and between the pole surfaces, will, like adobe, resist even the tropical rains of the region.

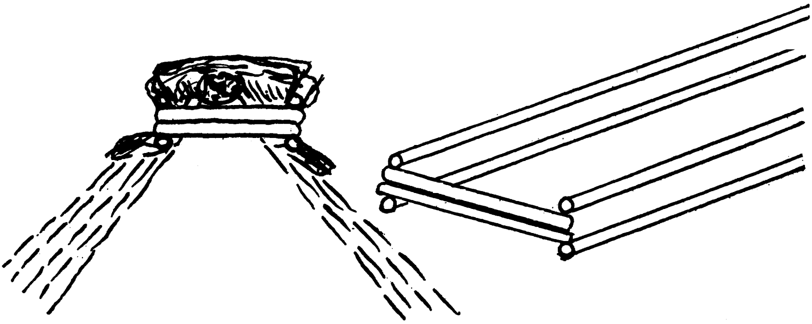


FIG. 69.

The zone of wall surface directly beneath the overhang of the thatch is the place where the people of the ná suspend certain valued articles or things that can not for various reasons be kept indoors. Being under the overhang of the thatch they are generally dry and at the same time are high enough above the ground to be beyond the reach of predatory animals. It is on this zone that the trophies of the hunt are generally placed and exposed for drying, the skin of a jaguar or that of a python, the tail-fan of a golden turkey, or the carapace of an armadillo. I call this the "trophy zone" of the ná.

The type ná is thirty feet long by fourteen feet and six inches wide, and nineteen feet high. From the floor to the pach-ná, house-back, corresponding to the spring of the arch, is ten feet, and from the pach-ná to the hol-ná, house-head, that is, from the spring of the arch to the apex of the roof, eight feet and six inches. The height of the first baló cross-piece from the floor is seven feet six inches. This baló being the most important of the cross-pieces is therefore the thickest, being over six inches in diameter. The second cross-piece, the cap-aac, is nine feet four inches from the floor, and is only four inches thick, while the chan-cap-aac at a height of eighteen feet and six inches from the floor is only three inches in diameter. These cross-beams are of the most vital importance to the safety of the ná. Without them the thatched roof is liable to collapse under an added burden, as for instance the moisture weight after a heavy rain. The material of these cross-pieces and that of the rattan-like *bejucos* that bind them to the roof-frame are matters of much moment to the careful builder of nás. I particularly wish to impress upon the mind the importance of these cross-pieces. The reason of this will appear later.

Measurements taken by me from over a hundred nás develop the following building rules, probably established through untold generations of practical experience. The width is half, and the height two-thirds of the length, the height of the wall from the floor to the spring of the arch is equal to that from the spring of the arch to the apex of the roof.

These rules are not adhered to by inches or the fraction of an inch. That they are adhered to as closely as they are, without the use of graduated rule or measure, is surprising, and only to be accounted for by the fact of an instinctive adherence to lines, even though fixed by the eye alone, that the accumulated experience of untold centuries has told them is the best adapted for their purpose, that of habitation and durability.

The floor of the ná if properly made is raised fully a foot above the immediately surrounding surface. That this is the rule and the intention of the fully developed ná is proved by the raised *pak* or surrounding base line. That these rules are not always adhered to is owing to the personal equation, the same reason why one person is " well groomed," buttoned up, and trim, while another is carelessly dressed, has buttons off, and is slouching or slatternly, There is character in a ná as in a mansion or in a person.

We have now studied the ná, dissected its parts, learned their purposes, and have re-assembled them into the perfect ná (fig. 70).

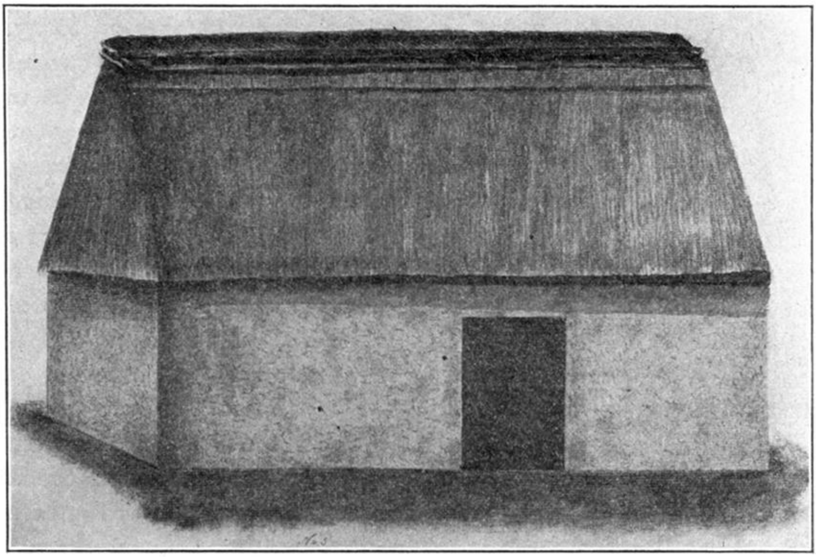


FIG. 70.—The completed ná.

We will now attempt the same so far as we may, first with the chamber and then with the edifice.

Like that of the ná, the chamber floor and that of the edifice as well is raised fully a foot above the former outside level. I say former outside level, because the accumulation and debris that together form the present surface must of course be discarded. To be exact the height of the stone outset of the chamber corresponding to the pak of the ná is exactly sixteen inches. In the different edifices of Chichen Itzá as well as those in the different groups of the peninsula, the height of this outset of stone changes but in degree only. It is always present and is the development in stone of the pak of the ná.

The floor of the chamber is made of the same material combined in the same mortar rate and in practically the same way as the better class of floors in the nâs of today, as already described. Of course it can not be said and proved that even the *chucum* water was used but the evidence is plain as to the mortar rate and the use of the kas or smooth stones for burnishing.

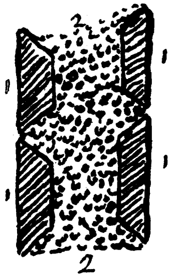


FIG. 71.

At this point it may not be amiss to state that, as the masons of those days worked and made their walls of stone and mortar, so do the native masons of today. They use the same mortar rate, the same curious methods of imbedding wedge-like stone chips to stiffen the plastic mortar mass, and probably the same method of transporting stones, by balancing them on their heads, rather than by employing hods or rope lifts. The walls were built up probably by placing the cut stones first, and then making the mass solid by a rubble and mortar mixture, a mortar grouting. Into this were then placed the wedge-shaped stone chips, and in time the whole mass became almost homogeneous (see fig. 71).

As in the case of the present nâs the edifice chambers seem to have had neither doors nor windows as we understand them. The curious little orifices in the stones at the entrances, worn smooth by attrition, indicate that curtains and interlaced wythe screens took the place of the doors. Light was probably admitted through these entrances, or was obtained by the use of the wild wax tapers that these ancient people were expert in making.

Ventilation in the southwest chamber was secured by horizontal ventilating shafts piercing the wall from face to face close to the spring of the arch. The shaft was too high up and too small to serve in the matter of lighting, but did serve perfectly well as a ventilator. It must be remembered that in the tropics the great problem is, not so much how to bring the light and heat in, as how to keep it out, or at least to tone it down.

At the height of eight feet the spring of the arch commences, with an outset of three inches, as shown in figure 72. The angle of wall inclination is about twenty-five degrees, and at a height of thirteen feet seven inches occurs the second jut or outset. The space between the inclined walls, or where would ordinarily be the apex, is truncated and in its place is a flat stone slab (fig. 73). This form is what is known as the " Maya arch."

At the respective heights of seven feet four inches, and eleven feet seven inches, there were inserted in the chamber walls four sets of cross-pieces corresponding, almost coinciding in position and size, with the cross-pieces of the ná, the balo, the cap-aac, and the chan-cap-aac so fully described before (fig. 74).

Now let us discuss the so-called Maya arch, and with it these cross-pieces, for both are intimately related. The Maya arch is an arch in name only, no key-stone is ever attempted, and the upper walls, though ever inclining inward, never meet. Their truncated planes are met and bound by flat stone slabs, and the weight of the mass above them.

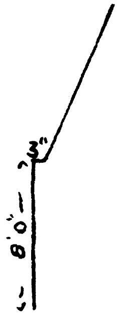


FIG. 72.

Why should a people so intelligent as to evolve a calendar system but little short of marvellous in its accuracy have taken up and kept to an architectural plan so faulty in principle and cumbersome in practice? Simply for this reason: Evolution that had for a time held sway was later arrested, cut short by a period of conventionalism, evolution ceased, and the process of crystallization set in. The chamber was evolved from the ná and the edifice was but a collection, a grouping of the nás when conventionalism gained the upper hand and development ceased.

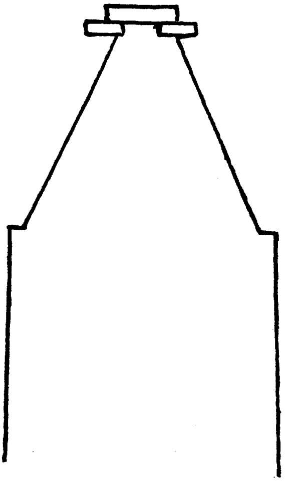


FIG. 73.

The inner wall surface and lines of the chambers are but those of the inner wall surface and lines of the ná expressed in terms of stone and lime; the juttings and spaces on the wall and ceiling are but the expressions in stone of the lines of the pach-ná and those of the hol-che. Those weak-looking cross-pieces so anomalous in the massive chamber walls are but the atrophied and almost disappearing tokens of the cross-pieces that are so important in the frame work of the ná and so useless in the chamber. That they did not utterly disappear from the outline of the chamber is perhaps due to the fact that they *are* so all-important in the ná. This survival of a once important function or act is seen in the turning of the horse and the dog before lying down, or, to bring it down to the common events of our own time, in the dress coat with its peculiar shape, which has survived while the rapier that called for it has long disappeared from use.

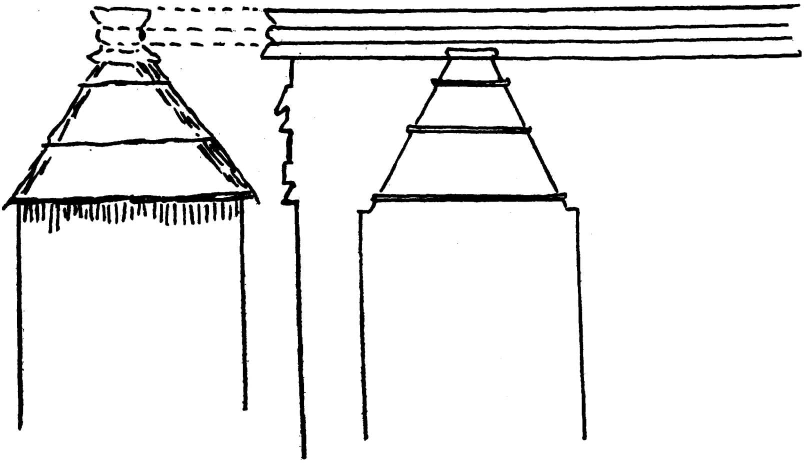


FIG. 74.

This in my opinion is the history and origin of the so-called Maya arch, a development from the ná cut short by conventionalism.

Now let us compare the outer walls of the chamber with those of the ná. The coincidence of the stone outset in the chamber wall with the pak of the ná has already been alluded to. By itself this coincidence means nothing, but, when combined with the other data, it means much. Like the walls of the ná those of the chamber and the edifice are divided into two broad zones. In the edifice of the Ah-kat-tzib, these zones are both plain, but this is unusual among the ancient structures of these groups, very rare indeed. As a rule the upper zone is devoted to symbolical designs, masks, serpent-symbols, meanders, and the like. This is the zone that in the ná I have called the trophy zone, a zone of direct utility in the ná, of conventional symbolism and ornamentation in the edifice. A lower zone is sometimes plain as in the Ah-kat-tzib, or covered with columns and spindle designs as in the Palace of Labná. Do not these two surfaces recall, the one the adobe surface of the ná and the other the poles with the wythe bindings?

Now we have reached the roofing. The terminal stone courses, the cap stones of the edifice, are ever as shown in figure 75 and they extend around the entire roof structure of the edifice. Whatever else may be added or omitted, these are ever constant, practically the same. What are they but the lines of the collective pac-hol, house-head wall, hol-ná, and those of the binders, the kat-ché and hol-ché carried out and conventionalized in stone (fig. 76)? Although conventionalized it was in a marked degree an intelligent conventionalism that tried to get the best out of the material and within the limits given. These collectively applied lines of the pac-hol-ná were so combined as to hold and to serve their old purpose as roof binding and rain shields, and so to keep the waters of the roof as well from striking and defacing the symbols on the upper zone, as from what was in the ná, the trophy zone.

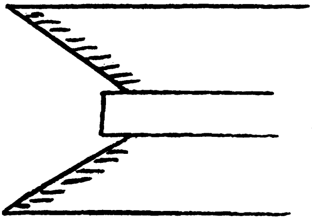


FIG. 75.

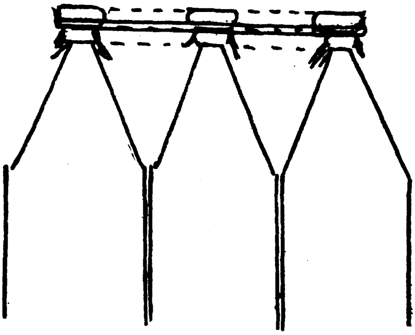


FIG. 76.

From these facts and data the safe conclusions to be drawn are these: The base lines, the ground measurements of the chambers and the edifice as well, are those of the ná. The wall lines and measurements of the chamber are practically those of the ná. The shape, the inclinations, the general proportion of the chamber walls and roofing follow closely the lines of the ná,—lines, angles, and measurements fixed and necessary to the ná, arbitrary and conventional to the chambers of the stone edifice. The so-called Maya arch is but the lines of the ná roof-structure expressed in stone and lime. The roofing of the edifice follows the lines and intent of the ancient pak-hol-ná expressed in conventional lines of stone.

In short the ancient stone edifices of Yucatan are arrested developments from the ná of the region. The features which they present were a typical, and, as far as it went, a perfect development from the type ná as it exists today, in the wilder portions of the peninsula, and bear no indication of exotic origin. Conventionalism held this race hard bound and conventionalism holds among the brown-skinned race today. "Who am I that I should do different from what my father did?" is a frequent expression on the tongue of the native Maya.

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